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(19) (CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Friction Rock Stabilizers

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(57) 7 Claims

Notice: This application is as filed and may therefore contain an incomplete specification.



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ABSTRACT OF THE DISCLOSURE

A rock stabilizer of this invention includes an elongated metal tube, which is substantially circular in cross-section and a circumferential outwardly projecting stop at or adjacent one end of the tube and is characterised in that the stabilizer tube includes an open slot which extends over the length of the tube and through the stop to enable the tube and the stop to be reduced in diameter by closure of the slot in use and a metal ring which at least partially surrounds the tube and extends across the slot at the stop with the tube being movable relatively to the ring in its circumferential direction to enable the tube and stop to be reduced in diameter in use. Conveniently the stop is integral with the tube material and is provided by shortening the tube in the zone of the stop.

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FIELD OF THE INVENTION

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This invention relates to tubular friction rock stabilizers which are used for controlling stress induced fracturing and strain bursts in rock in underground mining or tunnelling operations and in general ground support applications.

BACKGROUND TO THE INVENTION

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Friction rock stabilizers which include elongated metal tubes which carry at one end a radially projecting stop and are slotted over their lengths are known. Many of the known stabilizers carry metal rings which either form the stop at the end of the tube or are located adjacent the stop and are circumferentially welded to the outer surface of the tube. A problem with these stabilizers, particularly if they are of the type in which the tube slot is an open slot to enable the tube to be compressed to a smaller diameter on its insertion into a predrilled rock hole of a slightly smaller diameter than the tube, is that the welded ring does not permit the slot to close at the mouth of the tube by holding the stop and a portion of the tube adjacent the stop at its original diameter which either prevents the tube from being fully fed into the hole until the stop abuts the rock face which carries the hole and or the larger diameter portion of the tube causes

spalding of the rock at the mouth of the hole. With stabilizer tubes of this type which do not include the rings it frequently happens that the dollies which are located in the mouths of the tubes, and with which the tubes are hammered into the holes, skew in the tube bores, particularly while the end of the tube is remote from the hole, to destructively breach the tube walls through the slots in the tubes. This problem arises as the tube slots may be as wide as 15mm before closure and the stabilizers are often pressed into the holes from awkward positions. The breached tubes are generally damaged to such an extent that the stabilizers are unserviceable and tediously have to be withdrawn from holes in which they are partially located.

SUMMARY OF THE INVENTION

A rock stabilizer according to the invention includes an elongated metal tube, which is substantially circular in cross-section and a circumferential outwardly projecting stop at or adjacent one end of the tube and is characterised in that the stabilizer tube includes an open slot which extends over the length of the tube and through the stop to enable the tube and the stop to be reduced in diameter by closure of the slot in use and a metal ring which at least partially surrounds the tube and extends across the slot at the stop with the tube being movable relatively to the ring in its circumferential direction to enable the tube and stop to be

reduced in diameter in use. Conveniently the stop is integral with the tube material and is provided by shortening the tube in the zone of the stop.

5 In one form of the invention the tube material at the mouth of the tube is folded outwardly from the bore of the tube and back towards the outer surface of the tube to define a substantially annular cavity in the stop with the ring being C-shaped and located in the stop cavity across the open slot with its free ends spaced from each other in the cavity opposite the slot.

10 Further according to the invention a portion of the tube from its mouth is outwardly belled with the stop being situated on the belled portion of the tube.

15 In another form of the invention the stop is substantially U-shaped in cross-section and may be spaced a short distance from the mouth of the tube. In this form of the invention the ring is attached to the tube.

BRIEF DESCRIPTION OF THE DRAWINGS

20 The invention is now described by way of example only with reference to the drawings in which:

FIGURE 1 is a plan view of one embodiment of the rock stabilizer of the invention,

FIGURE 2 is an enlarged end elevation of the rock stabilizer of Figure 1,

FIGURE 3 is a fragmentary side elevation of the rock stabilizer of Figures 1 and 2 shown sectioned on the line 3-3 in Figure 2, and

FIGURE 4 is a sectioned side elevation of a second embodiment of the rock stabilizer of the invention.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

The rock stabilizer 10 of the invention is made from a suitable resilient steel such as ASPM A607 Grade 60 Class 1 and as with conventional rock stabilizers has an outer diameter typically between 32mm and 48mm, a wall thickness of between 2,3mm and 3,2mm and the length of anything between 0,9 to 4 metres.

The rock stabilizer of Figures 1 to 3 consists of a generally parallel sided elongated metal tube 12 which is inwardly tapered at one end over a portion of its length 14 and which carries, at its other end, a stop arrangement 16 to prevent the mouth of the stabilizer tube entering the

hole in which the stabilizer is to be used, and in some applications, for holding a roof washer or bearing plate against the rock surrounding the hole mouth when the stabilizer is fully driven into the hole. The stabilizer additionally carries an open slot 18 which extends over the length of the tube including the portion of the tube which carries the stop 16.

The stop 16, as is more clearly seen in Figures 2 and 3, comprises an outwardly belled tube portion 20 at the mouth of the tube and an outward scroll 22 which is formed by folding the material at the mouth of the belled portion of the tube outwardly and the back towards the tube to provide a cavity 24 in the scroll. A closure ring 26 which is made from a resilient steel and is C-shaped as is shown in Figure 2, is located in the scroll 22 as it is formed with a portion of the ring bridging the tube slot 18 and its free ends located in the scroll cavity as illustrated in Figure 2.

In the Figure 4 embodiment of the rock stabilizer of the invention the stop arrangement 16 consists of an outwardly projecting U-shaped rib 28 which is formed by upsetting the tube towards its end as shown in the drawing and a closure ring 30. In this embodiment of the invention the closure ring 30 is a continuous ring and may be either frictionally attached to the tube 12 against the rib 28 or may be loosely located on the tube and tack welded to the outer surface of the tube preferably opposite the slot 18 so that as the slot is closed in use the material of the tube is free to move to

closure of the slot relatively to the ring.

5 In use, the stabilizer tubes of the invention are located in predrilled holes of smaller diameter than the outer diameters of the tubes 12 by locating suitable dollies in the mouths of the tubes and pressing the stabilizers by means attached to the dollies into the holes. The smaller diameter holes cause the slots 18 in the tubes at least partially to close progressively against the resilience of the metal from which the tubes are made as the tubes are pressed into the holes with the tube resilience outwardly biasing the tubes firmly into frictional engagement with the walls of the holes. The 10 rings 26 and 30 minimise the possibility of the dollies skewing from the bores of the tubes 12 through the slots 18 while the stops on the stabilizer tubes are well outside the mouths of the holes with their slots still wide open.

15 As the stop 16 of the tube 12 of the Figures 1 to 3 stabilizer approaches the mouth of the hole into which the stabilizer is being pressed the scroll 22 of the stop closes around the ring in the direction of the arrows in Figure 2 to enable the tube adjacent the stop and the stop itself to be 20 reduced in diameter without damage to the tube or the rock surrounding the mouth of the hole as the stop is driven up against the rock face surrounding the hole.

In the Figure 4 embodiment of the rock stabilizer the tube is merely closed to a smaller diameter inside the ring 30.

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The invention is not limited to the precise details as herein described and the stop 16 of the rock stabilizer of the invention could have any suitable shape which will perform the function of the stops 22 and 28 as described above.

CLAIMS

1. A rock stabilizer including an elongated metal tube,
which is substantially circular in cross-section and a circumferential
5 outwardly projecting stop at or adjacent one end of the tube,
characterised in that the stabilizer tube includes an open slot which
extends over the length of the tube and through the stop to enable the
tube and the stop to be reduced in diameter by closure of the slot in use
and a metal ring which at least partially surrounds the tube and extends
10 across the slot at the stop with the tube being movable relatively to the
ring in its circumferential direction to enable the tube and stop to be
reduced in diameter in use.

2. A rock stabilizer as claimed in claim 1 in which the stop
15 is integral with the tube material and is provided by shortening the tube
in the zone of the stop.

3. A rock stabilizer as claimed in claim 2 in which; the
tube material at the mouth of the tube is folded outwardly from the bore
20 of the tube and back towards the outer surface of the tube to define a
substantially annular cavity in the stop with the ring being C-shaped and
located in the stop cavity across the open slot with its free ends spaced
from each other in the cavity opposite the slot.

4. A rock stabilizer as claimed in claim 3 in which a portion of the tube from its mouth is outwardly belled with the stop being situated on the belled portion of the tube.

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5. A rock stabilizer as claimed in claim 2 in which the stop is substantially U-shaped in cross-section.

6. A rock stabilizer as claimed in claim 5 in which the ring is attached to the outer surface of the tube.

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7. A rock stabilizer as claimed in claim 5 in which the ring is a loose fit over the tube and is attached to the tube by a tack weld.

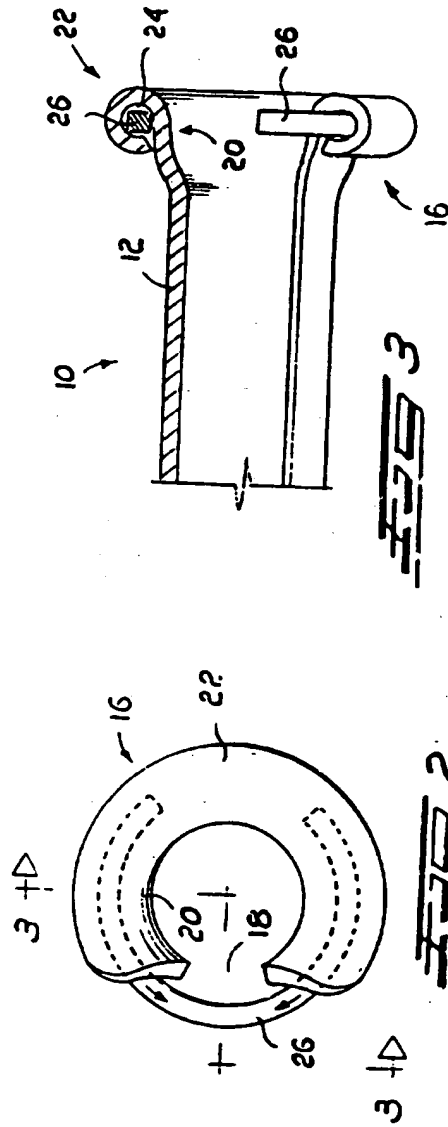
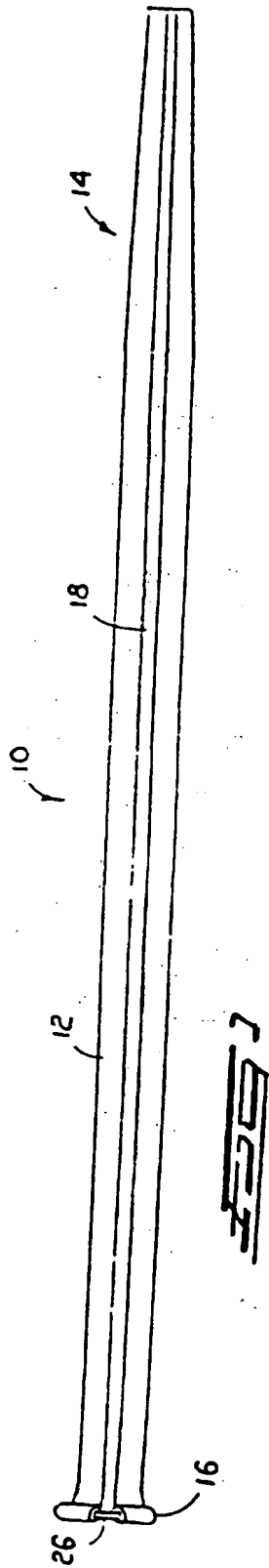


Fig. 3

Fig. 2

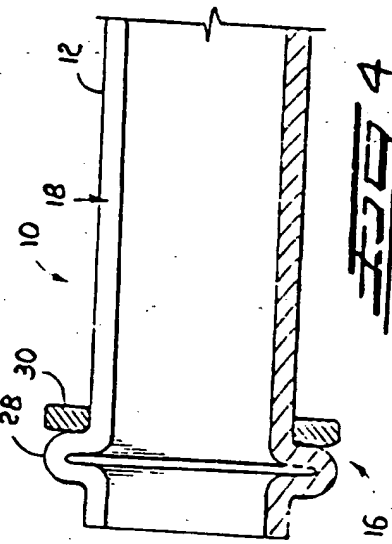


Fig. 4

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/CA2004/001878

A. CLASSIFICATION OF SUBJECT MATTER

E21D-21/00, E21D-20/00

According to International Patent Classification (IPC) or to both national classification and IPC 7

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Base de données de brevets Canadiens

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

CIB E21D-21/00, 20/00; USPC 405, 411

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Delphion (elastic, expansion, elast*, expan*)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 6,273,655 (McAlpine et col.) 14 août 2001 colonne 1, ligne 66 à colonne 2, ligne 7 colonne 5, lignes 19 à 38 colonne 6, lignes 11 à 31 figures 1 à 5	1-4, 9, 10, 12, 13, 16-18 11, 14, 15
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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search

Date of mailing of the international search report

07 mars 2005 (07-03-2005)

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/CA2004/001878

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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Information on patent family members

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